INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2005	**Park:** Shenandoah NP
Principal Investigator: Dr James Galloway	**Office Phone:** 434-924-1303 **Email:** jng@virginia.edu
Address: Dept of Environmental Sciences University of Virginia PO Box 400123 Charlottesville, VA 22904-4123 US	**Office Fax:** 434-982-2137

Additional investigators or key field assistants (first name, last name, office phone, office email):

Name: James R. Webb **Phone:** (434)924-1301 **Email:** rwebb@virginia.edu

Permit#:
SHEN-2004-SCI-0004

Park-assigned Study Id. #:
SHEN-00038

Project Title:
Shenandoah Watershed Study (SWAS)

Permit Start Date: Jan 01, 2004	**Permit Expiration Date** Dec 31, 2009
Study Start Date: Jan 01, 1990	**Study End Date** Dec 31, 2056

Study Status:
Continuing

Activity Type:
Research

Subject/Discipline:
Watershed Management / Assessment

Objectives:
The Shenandoah Watershed Study (SWAS) has both scientific and practical resource-management objectives. The underlying scientific objective of the SWAS program has been to improve understanding of hydro-biogeochemical processes and factors that govern ecosystem conditions in SNP's mountain watersheds. This scientific objective complements a resource management objective that has been defined by the need to document and assess change that is occurring in SNP's ecosystems.

Findings and Status:
This was the 26th year of watershed monitoring conducted in SHEN by the SWAS program. The monitoring framework currently includes 14 study watersheds selected to represent the major bedrock types in SHEN. Data collection includes quarterly, weekly and hourly sample collection for analysis of stream water composition, discharge gauging, and collection and analysis of precipitation.

The most significant findings for the 2004 data collection period:

â ¢ Most of the study streams were more acidic in 2004 than in 2003, based on ANC and pH.

â ¢ For all of the study streams, the concentrations of base cations (Ca2+ + Mg2+ + Na+ + K+) were lower in 2004 than in 2003.

â ¢ For most of the study streams, sulfate concentrations were lower in 2004 than in 2003.

â ¢ For most of the study streams, nitrate concentrations were higher in 2004 than in 2003.

The observed increase in stream water acidity between 2003 and 2004 contrasts with previous long-term trend analysis reported for the period ending in 2003. This difference can be largely explained by the sharp decrease in base cation concentrations among all streams. Sulfate concentrations decreased between 2003 and 2004 and thus were not associated with the increase in acidity. However, nitrate concentrations, which should also be associated with increased acidity, increased between 2003 and 2004.

The decrease in concentrations of base cations between 2003 and 2004 is consistent with trends reported for the period ending in 2003, but the magnitude of the decrease is generally greater. This observation may be explained by long-term depletion of base cations in watershed soils, a factor that may affect both forest productivity and prospects for recovery from stream water acidification.

The general decrease in sulfate concentrations between 2003 and 2004 was consistent with long-term trends reported for the period ending in 2003, and consistent with expectations given recent reductions in sulfur emissions and deposition. The decrease in sulfate or total strong-acid anion concentration in stream water, however, was evidently insufficient to offset the concurrent decrease in the sum of base cations.

The general increase in nitrate concentrations between 2003 and 2004 contrasts with previous long-term trend analysis reported for the period ending in 2003. Although this increase may partly explain the increase in acidity, the total strong-acid anion concentration in stream water, generally decreased, as stated above. The cause of the observed increase in nitrate concentrations is unknown, though it may be related to continuing effects of forest defoliation by gypsy moth larva or other forest disturbance.

For this study, were one or more specimens collected and removed from the park but not destroyed during analyses?

No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
62000	0

Fill out the following ONLY IF the National Park Service supported this project in this reporting year by providing money to a university or college

Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
University of Virginia	62000